**Title: A Study in Classification**

**Brief Overview:**

Classification is an important concept in understanding the Subdivision of the Biological Kingdoms. This lesson will help the students understand the relationships of similarities and differences of a particular thing within a population of many. Students will learn to categorize using at least three different characteristics. Students will also enumerate the individuals within the population based on the characteristics as well as make probability and statistical analysis related to the population based on their sampling.

**NCTM Content Standard/National Science Education Standard**:

Data Analysis and Probability –

Instructional programs from prekindergarten through grade 12 should enable all students to:

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them;
- Select and use appropriate statistical methods to analyze data;
- Develop and evaluate inferences and predictions that are based on data;
- Understand and apply basic concepts of probability

Maryland Science and Math Standards

Science Standard: 1.12.2a Also MLO Maryland Learning Outcome: 3.8.7
Analyze factors that influence the size and stability of a Population

Standard:
1. Skills and Processes:
Students will demonstrate the thinking and acting inherent in the practice of science.

Scientific Inquiry:
Indicators:
A. Collect, organize, and display data in ways others can verify (i.e. numbers, statistics, tables, graphs, drawings charts, diagrams) using appropriate instruments (e.g., calculators, spreadsheets, databases, and graphing programs).
B. Analyze and summarize data to identify trends and form a logical argument about a cause and effect relationship or a sequence of events.
C. Interpret and communicate findings (i.e. speaking, writing and drawing) in a form suited to the purpose and audience, using developmentally and appropriate methods including technology tools and telecommunication.
2. Critical Thinking
Indicators:

A. Describe similarities and differences of objects, materials, concepts and actions
B. Construct and use classification system for group objects, materials, concepts, actions and organisms, etc.
C. Critique scientific information and identify possible sources of bias
D. Analyze and extend patterns
E. Modify ideas based on new information from developmentally appropriate readings, data and ideas of others.
F. Describe to others how scientific information was used.

Math Standard: Knowledge of Measurement
3C2a Analyze Measurement relationships-Use proportional reasoning to solve measurement problems
Knowledge of Statistics
4A1a Data Displays-Organize and display data-Organize and display dat to make circle graph
4B1a Data Analysis-Analyze Data-Interpret Tables
4Bld Interpret Circle Graph
Knowledge of Probability –
5C1a Experimental Probability – Analyze the results of a survey or simulation – Make a prediction and express results as a fraction, a decimal and a percent with no more than 2 decimal places or a percent

**Grade/Level:**

$7^{th}$ and $8^{th}$

**Duration/Length:** 3 – 45 minute Classroom, 3-45 minute -Homework

**Student Outcomes:**

Students will:
A. Learn to construct various classification systems and infer degree of divergence and/or kinship of various objects materials concepts or organisms using a worksheet.
B. Critique scientific information and identify possible sources of bias using statistical and probability studies using a worksheet.
C. Analyze and extend patterns using a worksheet
D. Collect, organize and display data in ways others can verify by the use of graphs, charts, tables, drawings or diagrams. Graphing tools can be used if available.

**Materials and Resources:**

- Seeds (Parrot Seed Mix)– 15cc out of Jar of 100cc
- Lesson One – Seed Worksheets – Classifying-Sorting (Lay out Data)

Worksheet for Student Selected Items

- Lesson Two – Worksheet 2 – Seed Probability Worksheet
  Student Selected Items Probability Homework Sheet
- Lesson Three – Worksheet 3 – Seeds Statistical Worksheet
  Student Selected Items Statistic Homework Sheet

**Development/Procedures:**

Lesson 1

Preassessment – Discussion of Places that classify such as Libraries, Grocery Stores or Music Stores

Assessment – Verbal Quizzing 0-1-2 scale – 0- no understanding, l – sufficient Normal – 2. Very knowledgeable.

Launch – Classification

- Have students count seeds in 15cc.
- Ask students to determine how many seeds are in each grouping.

Exploration

- Students should see how many different groups could be made.
- Students should make some connections between groups.
- Students should find different groups that seeds could fall into in their exploration.

Teacher Facilitation

- Facilitate a discussion of various groups that different students have come up with in their exploration.
- Hand out seed worksheets with questions involved in the investigation.
- Discuss seed worksheet and objectives.
- Discuss and work with the students to build their understanding of the concept of classification.

Student Application

- Students will fill in chart.
- Students will add total number of each Seed by categories of Type, Size, Color and Shape.
- Students will tape seed to chart in Categories.
- Students will draw a diagram of each seed.
- Students will describe types of seeds.

Embedded Assessment

- Students will fill out seed worksheets, charts, tape seeds, and draw diagram.

Reteaching/Extension –

- Have students who have found other categories share with classmates who have had difficulty seeing various categories.
- For those who have many categories have them add more than the four – type, shape, color, size.
- Have students work on Seed Statistical by forming groups and compiling their data.
- Have students and each group selects an item to be categorized by characteristic to fill out Student Selected Items Statistical Worksheet.

Lesson 2

Preassessment-

- Ask students some examples of probability such as rolling dice or flipping a coin.

Launch -

- Predict the number of seeds in four categories (give each student a new sample of 10cc or seeds).

Assessment –

- How many were correct in predictions?

Teacher Facilitation –

- Use Seed Probability Worksheet to find portions to whole sample, ratios and percentages of each type seed to the whole in each of the four categories.
- Use Student Selected Items Statistical Worksheet to find portions to whole sample, ratios and percentages of each type item to the whole in each of the four categories.

Student Application –

- Students, while working on Probability Worksheet, will explore concepts of probability, ratios, and percentages.

Embedded Assessment-

- Students will complete worksheets and assessment will be achieved by completing math on worksheets according to their samples and observations.

Reteaching/Extension-

- Students who are having difficulty could be given smaller samples to use or an easier sample to discern.
  Students who have easily understood and completed the worksheets could be asked to find mathematical calculations of a larger population or of more categories to investigate or estimate the sample population from the whole bucket.

- Have each of the student groups do the Students' Selected Items Probability Homework Worksheet for their item selected.

Lesson 3

Preassessment –

- Assess understanding of statistics by calculating the grade average in the class, height or age.

Launch-

- Have students record everyone's height in class and compare it to their own height.

Teacher Facilitation –

- Students will take data from seed counting from members doing similar categories.
- Students break into groups during class, then students do a statistical analysis of the mean, median and mode.

Student Application -

- Have students do calculation and fill out Seed Statistical Worksheet.

Embedded Assessment-

- Completed worksheet on Mean, Median and Mode.

Reteaching/Extension-Work on the Statistics Homework Sheet reinforcing concepts by categorizing and doing probability and statistical analysis on items at home.

- Have each of the student groups do Students' Selected Items Statistical Homework Worksheets.

**Summative Assessment**:

Students will be assessed by completing worksheets both in class and at home. Data collected will be used in all three activities to do measurement, probability and statistic activities. The student's mastery of the Maryland standards would be determined by their completion of the worksheets both in class and home and by their data input into the class discussion compiling the data and going over their results. This would include the Measurement, Probability, and Statistics Standards as well as the Standards in Science for Skills and Processes, and Critical Thinking.

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# Classification

## Seed Worksheet

Materials: One Paper Towel
One Tablespoon (15cc) of a variety of Parrot Bird Seed
One Container with 100 cc of a variety of Parrot Bird Seed

l. Take seeds and choose a characteristic (size, shape, color, etc.), sorting the seeds into as many categories as possible.
   A. You must have at least three categories.
   B. Count how many individual seeds are in each category.

2. Choose a second characteristic, sorting one of the piles into subcategories.
   A. You must have at least two subcategories.

How many categories did you find? _____

Do you think there are more than what you found? Explain.

_____

_____

_____

Describe the characteristics that determine your categories.

l. _____

2. _____

3. _____

4. _____

Choose one characteristic and count the number of seeds in each category:

Characteristic: _____

Category 1_____

Category 2_____

Category 3_____

Complete the chart below filling in names of the characteristics and categories and entering the number of individual seeds in each category.

| Characteristic | Category 1 | Category 2 | Category 3 | Category 4 etc. |
|---|---|---|---|---|
| Example:<br>*Size* | *Small*<br><br>*Number___* | *Medium*<br><br>*Number___* | *Large*<br><br>*Number____* | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Are there individual seeds that could fit in more than one category? Explain.

_____

_____

_____

Choose another pile of your seeds. Choose another characteristic and sort this pile into subcategories.

List the new subcategories:_____

Your seed now belongs to at least two categories. Choose five seeds. Tape them into the table below and list all of the categories you can.
(i.e. Shape, Color, Size---Round, White, Small)

| Tape seeds here | List all categories here: |
|---|---|
| | |
| | |
| | |
| | |
| | |

What do these seeds have in common?_____

_____

_____

How are they different? _____

_____

_____

# Classification

## Worksheet 2 for **Lesson 1 Homework**

Categorize Items at Home

Pick something at home, i.e., CD Collection, Clothes, Dishes, and repeat the activity as we did in class.

How many categories did you find? _____

Do you think there are more than what you found? Explain.

_____

_____

_____

Describe the characteristics that determined your categories:

1. _____

2. _____

3. _____

4. _____

Choose one characteristic and count the number of items in each category:

Category 1_____

Category 2_____

Category 3_____

Complete the chart below filling in names of the characteristics and categories and entering the number of individual items in each category.

| Characteristic | Category 1 | Category 2 | Category 3 | Category 4 etc. |
|---|---|---|---|---|
| Example:<br>*Size* | *Small*<br><br>*Number___* | *Medium*<br><br>*Number___* | *Large*<br><br>*Number____* | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Are there individual items that could fit in more than one category? Explain.

_____

_____

_____

Choose another group of your items. Choose another characteristic and sort this group into subcategories.

List the new subcategories:_____

Your item now belongs to at least two categories. Choose five items. Draw them into the table below and list all of the categories you can.
(i.e. Shape, Color, Size---Round, White, Small)

| Draw Items here | List all categories here: |
|---|---|
| | |
| | |
| | |
| | |
| | |

What do the items have in common? _____

_____

_____

How are they different? _____

_____

_____

# Seed Probability Worksheet

1. What are your four characteristics of classification? _____
2. For each characteristic, how many seeds are in each category? _____
3. For each characteristic, how many total seeds are there? _____
4. Estimate Percentage of the seeds that are large.

For problems 5-9, use decimals.

5. What is the probability that a seed in your population will be white?
6. What is the probability that a seed in your population will be small?
7. What is the probability that a seed in your population will be round?
8. Pick another feature to compute its probability of not being large?
9. What should be the probability of a seed being large or not large?
10. What would the probability of a seed being both large and small?
11. In numbers 5-9, what would the percentages of each be?
12. What would the ratio of your sample in each category be to the whole of your population? (Be sure to reduce the ratio.)
13. Separate your population by size, color and shape. For each characteristic, draw a circle graph depicting the number in each category.
14. If you have a graphing program tool, use the list function and graphing function in doing Number 13.

# Probability Homework Worksheet for Students' Selected Items

(Items to be Categorized at Home)

1. What are your four characteristics of classification? _____
2. For each characteristic, how many items are in each category? _____
3. For each characteristic, how many total items are there? _____ __
4. Estimate Percentage of the items with one characteristic related to the whole.

For problems 5-9, use decimals.

5. What is the probability that an item in your population will be a certain characteristic?
6. What is the probability that an item in your population will be the opposite characteristic to Number 5?
7. Give another characteristic not described before. What is the probability relating that characteristic to the total population of items.
8. Pick another feature to compute its probability of relating to number 7.
9. Are 7 and 8 items mutually exclusive?
10. Would there be a probability that both could occur?
11. What are the percentages in your population of the different items in your categories?
12. What would the ratio of your items in each category be to the whole of your population? Be sure to reduce the ratio.
13. Separate your population by three characteristics and for each characteristic, draw a circle graph depicting the number in each category.
14. If you have a graphing program tool, use the list function and graphing function in doing Number 13.

# Seed Statistical Worksheet

1. Divide into groups of three or four individuals with data from characteristics by category.

2. Fill in the chart by each individual in group with number of seeds in each category of a selected characteristic. All students in the group must use the same categories for the characteristic they choose.

| Characteristic | Student l | Student 2 | Student 3 | Student 4 | Combined Total |
|---|---|---|---|---|---|
| Category l | | | | | |
| Category 2 | | | | | |
| Category 3 | | | | | |
| Category 4 | | | | | |
| Total | | | | | |

3. What is the average number of seeds in each category?

4. What is the total of all categories?

5. What is the total number of each student's sample?

6. Design a bar or circle graph to show the results of the group's data.

7. Have combined data ready to compute the group's Mean, Median and Mode for each of the four categories.

8. If you also have a graphing program, use the list function and graphing function in creating your design showing the results of group data.

# Statistical Homework Worksheet for Students' Selected Items

1. Divide students into groups of three or four individuals with data from characteristics by category.

2. Fill in the chart by each individual in group with number of seeds in each category of a selected characteristic. All students in the group must use the same categories for the characteristic they choose.

| Characteristic | Student l | Student 2 | Student 3 | Student 4 | Combined Total |
|---|---|---|---|---|---|
| Category l | | | | | |
| Category 2 | | | | | |
| Category 3 | | | | | |
| Category 4 | | | | | |
| Total | | | | | |

3. What is the average number of items in each category?

4. What is the total of all categories?

5. What is the total number of number of items in each student's sample?

6. Design a bar or circle graph to show the results of the group's data.

7. Have combined data ready to compute the group's Mean, Median and Mode for each of the four categories.

8. If you also have a graphing program, use the list function and graphing function in creating your design showing the results of group data.